REMARKS

Claims 1-8 are now pending in the application. No amendments have been made herein. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the remarks contained herein.

REJECTION UNDER 35 U.S.C. § 103

Claims 1-8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pat. No. 6,919,062 ("Vasileiadis") in view of U.S. Pat. Pub. No. 2004/0157099 ("Kato") and further in view of U.S. Pat. Pub. No. 2003/0159354 ("Edlund"). This rejection is respectfully traversed.

Applicant submits that the cited prior art references do not render obvious claim 1 because the references fail to teach or suggest a "fuel cell system . . . comprising: a fuel cell stack including a plurality of proton exchange membranes . . . and a plurality of coolant passages extending between adjacent ones of said plurality of proton exchange membranes; and a conduit in fluid communication with said coolant passages . . . and comprising a first layer of hydrogen-permeable material," as recited in claim 1.

Vasileiadis discloses feed gases and steam flowing through a permreactor-separator, yielding a hydrogen-based gas that can be supplied to an anode side of a fuel cell stack (Abstract, FIG. 11). Vasileiadis further discloses the permreactor-separator comprising a hydrogen permeable tube (Col. 3, Line 63 – Col. 4, Line 9). As the Examiner acknowledges, Vasileiadis does not disclose that the hydrogen permeable tube is in fluid communication with coolant passages extending between proton exchange membranes of a fuel cell. Thus, Vasileiadis does not teach or suggest a hydrogen-permeable conduit in fluid communication with coolant passages, as claimed.

Kato discloses coolant passages 32a, 32b between membrane electrode assemblies 22 in a fuel cell 12 (FIG. 2). The Examiner cites Kato for teaching that it is well known to employ coolant passages between membranes of fuel cells. The Examiner asserts that it would have been obvious to employ the cooling arrangement of Kato in the fuel cell of Vasileiadis in order to control stack temperature and reactivity between the fuel cells. However, Kato does not teach or suggest a hydrogen-permeable conduit in fluid communication with coolant passages, as claimed.

Edlund discloses a steam reformer 12 that separates a hydrogen stream from a vapor feedstock to provide hydrogen to a fuel cell 16 and that includes a membrane tube 54 (Para. [0033], Lines 4-5; Para. [0034], Lines 1-11; Para. [0040], Lines 1-7; FIGS. 1 and 2). Edlund further discloses that the membrane tube 54 may be composed of hydrogen-permeable materials (Para. [0043], Lines 4-7). The Examiner cites Edlund for teaching that it is well known to employ hydrogen-permeable tubes in fuel cell stacks. The Examiner asserts that it would have been obvious to employ the tube of Edlund in the fuel cell of Vasileiadis in order to separate products in the vicinity of the membrane tube. However, Edlund does not teach or suggest a hydrogen-permeable conduit in fluid communication with coolant passages, as claimed.

Thus, none of the references teach or suggest a hydrogen-permeable conduit in fluid communication with coolant passages, as claimed. It is a longstanding rule that to establish a prima facie case of obviousness of a claimed invention, all of the claim limitations must be taught or suggested by the prior art. *In re Royka*, 180 USPQ 143 (CCPA 1974). *See* MPEP § 2143.03. For at least the above reasons, Applicant respectfully asserts that claim 1 defines over the cited art.

Nonetheless, the Examiner asserts that Vasileiadis discloses a hydrogen permeable tube in fluid communication with coolant passages extending between membranes of a fuel cell because fuel passages and the claimed coolant passages are both located between proton exchange membranes. The Examiner also asserts that the permreactor-separator of Vasileiadis satisfies the instant claims because the fuel from the permreactor will be charged to fuel passages located between the membrane and electrodes in order for the fuel cell to function. The Examiner further asserts that the conduit is in fluid communication with the passages by providing fuel to the fuel cell.

At the outset, Applicant notes that Vasileiadis does not explicitly disclose that the permreactor-separator is in fluid communication with fuel passages extending between proton exchange membranes. Rather, as discussed above, Vasileiadis discloses that the permreactor-separator is in fluid communication with the anode side of a fuel cell stack. However, even if Vasileiadis were to disclose that the permreactor-separator is in fluid communication with fuel passages extending between proton exchange membranes, Applicant maintains that Vasileiadis does not teach or suggest a hydrogen-permeable conduit in fluid communication with coolant passages extending between proton exchange membranes, as claimed.

Applicants note that Vasileiadis, as well as Edlund, must be considered in their entirety, i.e., as a whole, including portions that would lead away from the claimed invention. "A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention." *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984). *See* MPEP 2141.03.

As discussed above, Vasileiadis and Edlund disclose passing steam and feed gases through a hydrogen-permeable tube to separate hydrogen for use in a fuel cell. In addition, Vasileiadis discloses supplying hydrogen to the anode side of a fuel stack. Modifying the fuel cell systems of Vasileiadis and Edlund by placing the disclosed hydrogen-permeable tubes in fluid communication with coolant passages would ignore the portions of Vasileiadis and Edlund that lead away from the claimed invention. More specifically, modifying the fuel cell systems of Vasileiadis and Edlund in this manner would ignore the portions of Vasileiadis and Edlund that teach the hydrogen-permeable tubes are for separating hydrogen for use as fuel in an anode side of a fuel stack.

In addition, Applicant submits that the cited prior art references do not render obvious claim 3 because the references fail to teach or suggest a "support layer" that is "breathable to enable passage of said hydrogen to atmosphere," as recited in claim 3.

Vasileiadis discloses a next inner membrane tube (1) through which hydrogen permeates (Col. 6, Lines 16-21; FIG. 1). Vasileiadis further discloses a far outer impermeable tube/shell (7) that prevents passage of hydrogen to atmosphere (FIG. 1). The Examiner asserts that in disclosing the hydrogen-permeable next inner membrane tube (1), Vasileiadis discloses a support layer that is breathable. However, the Examiner does not address the remainder of the limitation, which recites that the support layer is breathable "to enable passage of said hydrogen to atmosphere."

Moreover, Applicant reiterates that modifying the permreactor-separator of Vasileiadis to include a support layer that is breathable to enable passage of hydrogen to the atmosphere would render the permreactor-separator unsatisfactory for its intended purpose of capturing hydrogen for use in a fuel cell. "If proposed modification

would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification." *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). *See* MPEP 2143.01.

Finally, Applicant submits that Edlund must be considered for additional teachings that lead away from claims 1 and 3. Edlund discloses that the membrane tube 54 is surrounded by an inner metal tube 52, which is surrounded by an outermost metal tube 50 (Para. [0040], Lines 2-5; FIG. 2). Edlund further discloses that some hydrogen outside of the membrane tube 54 passes through the membrane tube 54, and the remaining hydrogen is combusted in a region between the inner metal tube 52 and the outermost metal tube 50 (Para. [0035], Lines 1-15; Para. [0043], Lines 1-4; FIG. 3).

Thus, Edlund teaches hydrogen permeating the membrane tube 54 from outside of the membrane tube 54. Edlund does not teach hydrogen permeating through a first layer from within the first layer, as recited in claim 1. The Examiner asserts that the direction of hydrogen permeability does not preclude the skilled artisan from appreciating the hydrogen permeability characteristic. Nonetheless, Applicant maintains that the direction of hydrogen permeability in Edlund leads away from claim 1. In addition, Edlund teaches combusting hydrogen in the region between the inner metal tube 52 and the outermost metal tube 50. Edlund does not teach passing hydrogen through a support layer that is breathable to the atmosphere, as recited in claim 3.

Accordingly, the prior art fails to teach or suggest all of the limitations of claims 1 and 3. In addition, claims 2-8 depend from claim 1 and should be patentable for the reasons set forth above supporting the patentability of claim 1. Therefore, reconsideration and withdrawal of the rejection of claims 1-8 are respectfully requested.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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